

## English translation of DE 196 27 865

Temporary tooth filling

5 The invention relates to a tooth filling, in particular to a temporary tooth filling comprising a filling material, in particular an antiseptic and/or therapeutic filling material, as well as at least one solid body which is solid before its application or particles according to the preamble of claim 1.

10 Temporary tooth fillings are used in root canal treatments. For this purpose the tooth is opened where the carious lesion is found using a drill, mostly in the area of the chewing surface. In order to be able to perform a root extraction the depth of the tooth cavity to be prepared is relatively large. The tooth is treated in the root area if necessary up to the adjacent jaw bone through this opening. In many cases painful inflammations are observed which make a tooth treatment necessary. Usually the areas affected by a painful inflammation are treated with a medicament. If necessary the root canals are cleaned to remove the tissue area affected by the inflammation. In most cases it is not possible to treat all affected areas immediately.

25 Usually, the inner part of a tooth is rinsed with e.g. hydrogen peroxide, treated with a medicament and then sealed with a temporary filling until the inflammation is gone. This procedure has the disadvantage that in case of an active inflammation a gas pressure can be built up. This gas pressure causes pain.

30 In case of a severe inflammation especially if the inflammation affects the jaw area adjacent to the tooth root, the tooth is not closed for a certain time to release the inflammation pressure.

35 DE 44 45 937 C1 discloses a tooth filling comprising a geometrical solid body which is applied to the tooth defect which has been enlarged by drilling.

This tooth filling tries to achieve a suitable sealing of the tooth defect by an appropriate form of the filling and the tooth cavity. Air inclusions are avoided but such a filling is only suitable for a permanent filling. This  
5 tooth filling is not suitable for a temporary therapeutic filling since it hermetically seals the tooth. In case of an inflammation in the root area the inflammation pressure can not escape.

Temporary fillings known in the art seal the  
10 tooth in such a manner that a pressure built up by an inflammation can not escape.

The problem to be solved by the invention is to provide a tooth filling, in particular a therapeutic tooth filling which allows the inflammation pressure to  
15 escape from the inner part of a tooth but which essentially prevents that liquids can penetrate from outside into the tooth.

This problem is solved according to the invention by a tooth filling with the characterising features of claim 1. Further preferred embodiments are  
20 claimed in the dependent claims.

The essence of the invention is that a semipermeable material is used as tooth filling or a material which becomes semipermeable when cemented in the  
25 tooth wherein the filling is cemented in the tooth defect or the prepared cavity, respectively. This leads to a "semipermeable" tooth i.e. the inventive filling allows the pressure to escape but prevents the penetration of moisture from outside into the tooth. Since in the mouth  
30 only liquid media or viscous liquids - chyme - are present, the selection of a material which prevents the penetration of liquids is sufficient. There is no problem to select a material which even prevents the penetration of gaseous media. This can be useful since it is known  
35 that e.g. the penetration of cigarette smoke up to the root canals of an open tooth can cause pain.

The cemented material can possess oriented semipermeable characteristics *per se* or gain the desired semipermeable characteristics in the cemented state. If a *per se* oriented semipermeable material is used, then its application has to be done in an oriented manner. It is as well possible to use hydrophobic fibre material. In the cemented state a pressure gradient along the fibre package is built up wherein the pressure in the tooth is slightly higher than the pressure outside. This leads to the preferred escape of the gas from the tooth. The selection of a hydrophobic material or a hydrophobic coating material prevents the penetration of moisture or liquids from outside into the tooth. For this embodiment the use of a specifically oriented semipermeable fibre material is not necessary. Semipermeability is achieved by material selection and a static gas-coupled equilibrium wherein the pressure in the tooth is slightly higher than outside thereby determining the gas flow direction.

One embodiment of the invention is the fixation of a semipermeable membrane in a ring shaped element which is inserted into the prepared tooth cavity and cemented in at its edges. The membrane can be a condensed fibre package having the mentioned semipermeable characteristics in order to achieve a sufficient statics. Since the temporary filling remains in the tooth only for the duration of the treatment and therefore no chewing pressure is exerted on the treated tooth, the membrane can have a laterally extended, foil-like shape which is fixed in said ring and has the mentioned semipermeable characteristics.

An embodiment of the invention which is possibly easier to handle is the cylindrically shaped body with semipermeable characteristics which are oriented along the cylinder axis or the fibre bundle, respectively.

This cylindrically shaped membrane possesses good statics, in particular when it is applied or ce-

mented in. This embodiment of the invention is especially easy to prepare and to apply and can also endure a certain chewing pressure.

In a preferred embodiment of the invention  
5 said fibre bundle-membrane can be produced as connected thread and can be unrolled subsequently so that the dentist can cut off and process the required length.

Due to the inventive direction or orientation dependent semipermeable characteristics of the material  
10 the unrolled thread must have an imprinted label or an arrow which recurs in short distances on its surface.

Of course, in both embodiments of the invention a therapeutic can be introduced into the cavity beforehand.

15 In addition, the membrane or fibre material, respectively, is selected in such a manner that the common therapeutics do not chemically react with said material so that its semipermeable characteristics are not impaired.

20 The invention is depicted in the picture and below further described.

It shows:

Fig. 1 cross section through a tooth which needs to be treated using a fibre package according to  
25 the invention.

Fig. 2 cross section through a tooth which needs to be treated using a laterally extended, foil-like membrane.

Fig. 3 Cross section through filled fibres

30 Fig. 4 Cross section through hollow fibres

Fig. 1 shows an embodiment of the invention in which a fibre package 10 is used as semipermeable membrane. Observing the vertical axis of the tooth 1, the fibres of the inserted fibre package 10 are essentially  
35 parallel to this vertically depicted axis. The semipermeable characteristics are therefore oriented along this axis i.e. the fibre package 10 allows escape of gas from

the inner part of the tooth - as shown by the arrow - but prevents the penetration of gas and/or liquids from outside into the tooth. The length of the used fibre package is chosen such that the fibre package 10 can be inserted loosely into the tooth cavity or drill, respectively, and touches the bottom of the cavity 5. Then the fibre package 10 is fixed by cement at the upper edge, in the area of or close to the chewing surface 4. The fixation is achieved by embedding with cement 12 in the edge area i.e. the cutting area 11 of the fibre package 10 as effective semipermeable membrane area remains uncovered so that the inflammation pressure can easily escape.

The cavity 5 in which the fibre package 10 is fixed, is connected to the root canals 3 such that even the inflammation pressure from the jaw bone area can escape. Furthermore, the use of the tooth filling according to the invention allows the use of therapeutics which cause the production of gas. Thus, the membrane of the invention or the fibre package interface, respectively, allow venting of the tooth although the tooth is closed.

Since the semipermeable characteristics of the fibre package can be direction dependent i.e. orientation dependent, the fibre package can be available as thread which can have at its surface a continuous label along its axis or an arrow which recurs in short distances. This marking is found on the surface of the fibre thread.

Fig. 2 shows a further embodiment of the invention wherein a laterally extended foil 20 is used as semipermeable membrane which possesses semipermeable characteristics and is fixed in a ring shaped element 21. This ring 21 is inserted in the tooth cavity 5 and cemented in at its edge. Also in this embodiment the active membrane surface has to be uncovered. Since the orientation has to be considered in this embodiment as well, the ring 21 has an external marking.

Fig. 3 shows a cross section through part of a fibre package 10. Filled fibres with a round profile are used. Even when tightly packed there are interspaces which create along the fibres the capillaries which are essential for the invention. In this embodiment the fibres are either made of hydrophobic material or are only hydrophobically coated.

Fig. 4 shows also a cross section through the fibre package 10 wherein hollow fibres are used. In this embodiment there are capillaries formed by the interspaces 30 and the internal capillaries 40. Thus, the hollow fibres are made of hydrophobic material or they are hydrophobically coated both on the outer surface and the inner surface of the internal capillaries 40.

Overall, the temporary tooth filling according to the invention is on the one hand easy to produce and on the other hand it can be applied easily and quickly. Thereby the tooth treatment becomes more effective and progressing inflammations caused by infections from outside can even be avoided when there is a severe inflammation. Both the inventive fibre package filling which is cemented in and the inventive foil membrane filling can easily be removed so that at the end of the treatment the permanent filling or the tooth inlet, respectively, can be inserted.

List of reference signs:

- 1 tooth
- 2 tooth root
- 3 root canal
- 4 chewing surface
- 5 tooth drill
- 10 fibre bundle
- 11 fibre package cross section
- 12 cement
- 20 lateral, foil-like membrane
- 21 ring

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30 interspaces  
40 internal capillary

Claims

1. Tooth filling, in particular a temporary tooth filling, comprising a filling material, in particular an antiseptic and/or therapeutic filling material, as well as at least one solid body which is solid before its application or particles, characterised in that said body or particles (10,20,21), respectively, are cemented in at there edge areas to seal the open tooth (1) against filling material or cement (12) such that at least a partial outer area of said body or the particles (10,20,21), respectively, remains uncovered and that the body or particles (10,20,21), respectively, at least over a certain part of its surface or geometrical dimensions consists of a semipermeable material or is semipermeable in the cemented state.

2. Tooth filling of claim 1, characterised in that the body consists of a ring (21) with a semipermeable membrane (20) which is fixed in the ring.

3. Tooth filling of claim 1, characterised in that the body or the particles, respectively, consists of a fibre package (10) which is inserted into the tooth (1) in an essentially vertical manner to the chewing surface (4) and has semipermeable characteristics.

4. Tooth filling of claim 2 or 3, characterised in that the fibre package (10) or the membrane (20), respectively, along its longitudinal extension in one direction is at least impermeable for liquids and in the other direction at least gas permeable.

5. Tooth filling of claim 4, characterised in that the fibre package (10) or the membrane (20) is inserted into the tooth i.e. the tooth cavity (5) in such an orientation that at least gases can escape from the inner part of the tooth and that at least no liquid can penetrate into the inner part of the tooth.



6. Tooth filling of anyone of the preceding claims, characterised in that the fibre package (10) consists of hydrophobic or hydrophobically coated fibres.

7. Tooth filling of claim 6, characterised in  
5 that the fibres of the fibre package (10) are hollow fibres which are hydrophobically coated both on the outer surface and within the capillaries.

8. Tooth filling of claim 6, characterised in  
10 that the fibres of the fibre package (10) are filled fibres with a hydrophobic external coating.

9. Tooth filling of anyone of the preceding claims, characterised in that the fibre package (10) is enveloped by a ring-shaped thin-walled envelope.

10. Tooth filling of anyone of the preceding  
15 claims, characterised in that the length of the fibre package (10) is adapted to the depth of the cavity (5) such that after completion of the temporary filling the fibre package (10) does not protrude beyond the chewing surface (4) of the tooth (1).

20 11. Tooth filling of anyone of the preceding claims, characterised in that the fibre package (10) comprises a therapeutic.

12. Tooth filling of anyone of the preceding  
25 claims, characterised in that the fibre package (10) forms a connected thread from which the required length which depends on the depth of the cavity (5), can be cut off and processed.

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